Integration of HEC NexGen Software for Watershed Studies

(Watershed Analysis Tool – WAT)

Problem Statement

- Corps watershed and water resources management studies involve the identification of problems and opportunities and subsequent analyses to address them.
- Studies require hydrologic, hydraulic, economic, environmental, and social impact assessments.
- Need to streamline and integrate the analytical process using the tools commonly applied by the multi-disciplinary teams of the district offices.

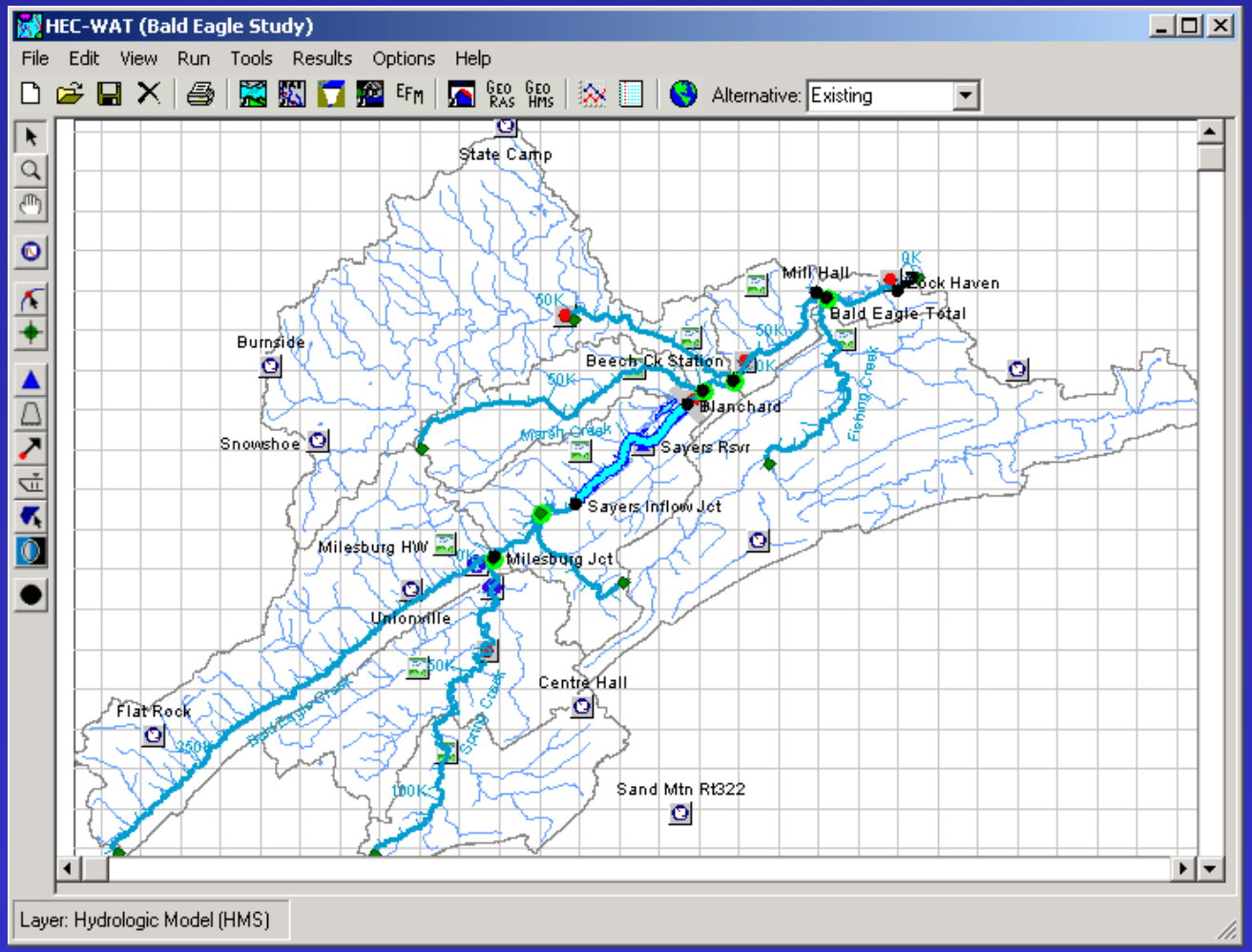
Objectives of the Watershed Analysis Tool (WAT)

- Help districts perform comprehensive watershed scale studies
- Create procedures and capabilities to provide an integrated suite of modeling software for watershed studies using the risk analysis approach
- Improve coordination and communication across Project Delivery Teams
- Share data across models
- Involve modelers early in the study process
- Encourage a team approach

Objectives

- Develop a Watershed Control and Visualization Interface (CAVI) as the umbrella interface for HEC and other models
- It will link HEC-HMS, HEC-ResSim, HEC-RAS, HEC-FIA, HEC-FDA, HEC-EFM & other software
- Will leverage past research
  - Design
  - Software coding
  - Historic data
  - Watershed models
  - Spatially referenced maps and displays
  - Internet/web-sight links

Watershed CAVI



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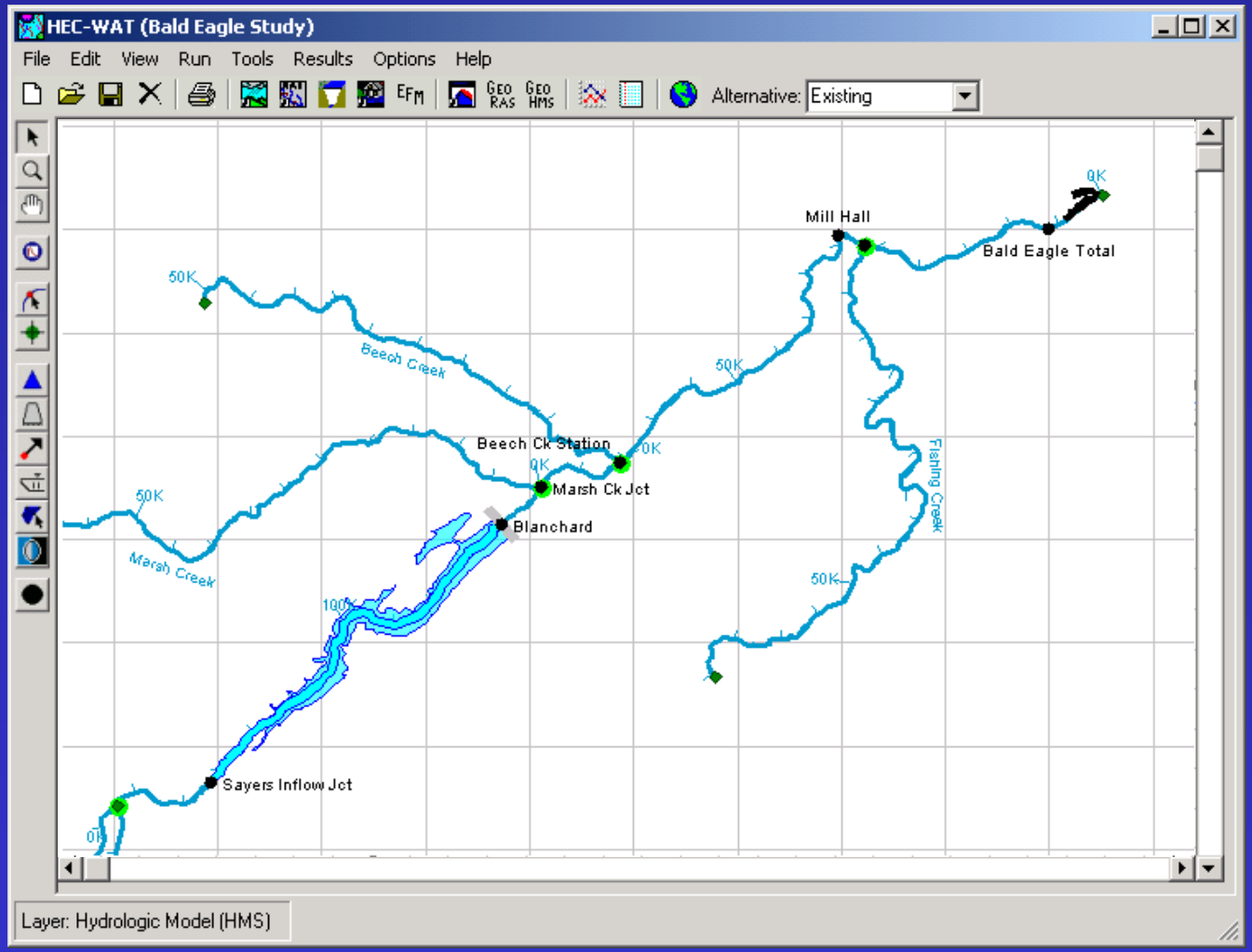
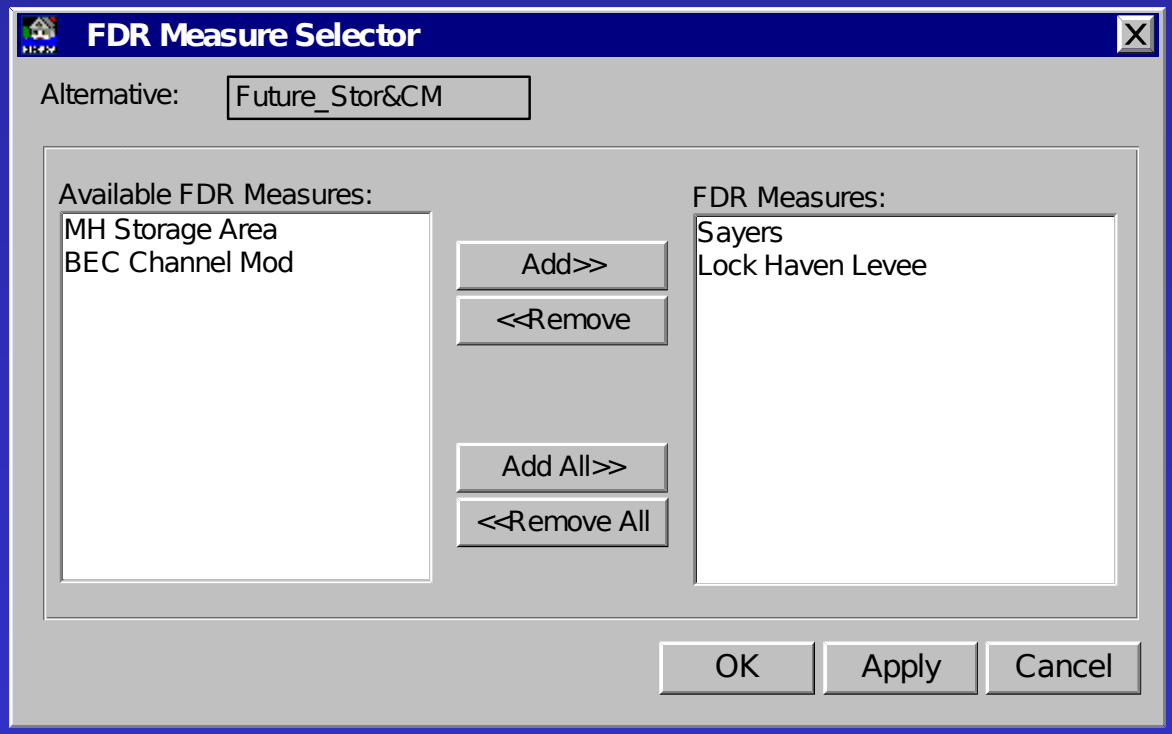
WAT Alternative Table

	Time Window 1					TW2	TW3	TW4	Time Window 5							
	Period of Record					Calibaration (History)			Events							
		Historic	Global	Precp 3	Precp 4	1997	1986		2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	200-yr	500-yr
Alternative 1	HMS	X	X			Jan97X1	Jan86X2		Ex_2yr	Ex_5yr	Ex_10yr	Ex_25yr	Ex_50yr	Ex_100yr	Ex_200yr	Ex_500yr
Base	ResSim					Jan97Res	Jan86Res		1980 Rule Curve							
Existing	RAS					Jan1997.p03	Jan1986.p02		RAS1996.p03							
	FDA	FIA1	FIA 2			FIA97	FIA86		**FDA Existing**							
Alternative 2	HMS															
2040	ResSim															
Existing	RAS															
	FDA								**FDA Most Likely Future Year**					**X Eqiv Annual Damage**		
Alternative 3	HMS															
Base	ResSim	OPT 1		OPT 2												
Existing w/	RAS															
Enlarged SW	FDA								**FDA Prob**							
Alternative 4	HMS															
2040	ResSim															
Existing w/	RAS															
Enlarged SW	FDA								**FDA Prob**							

Existing Alternative

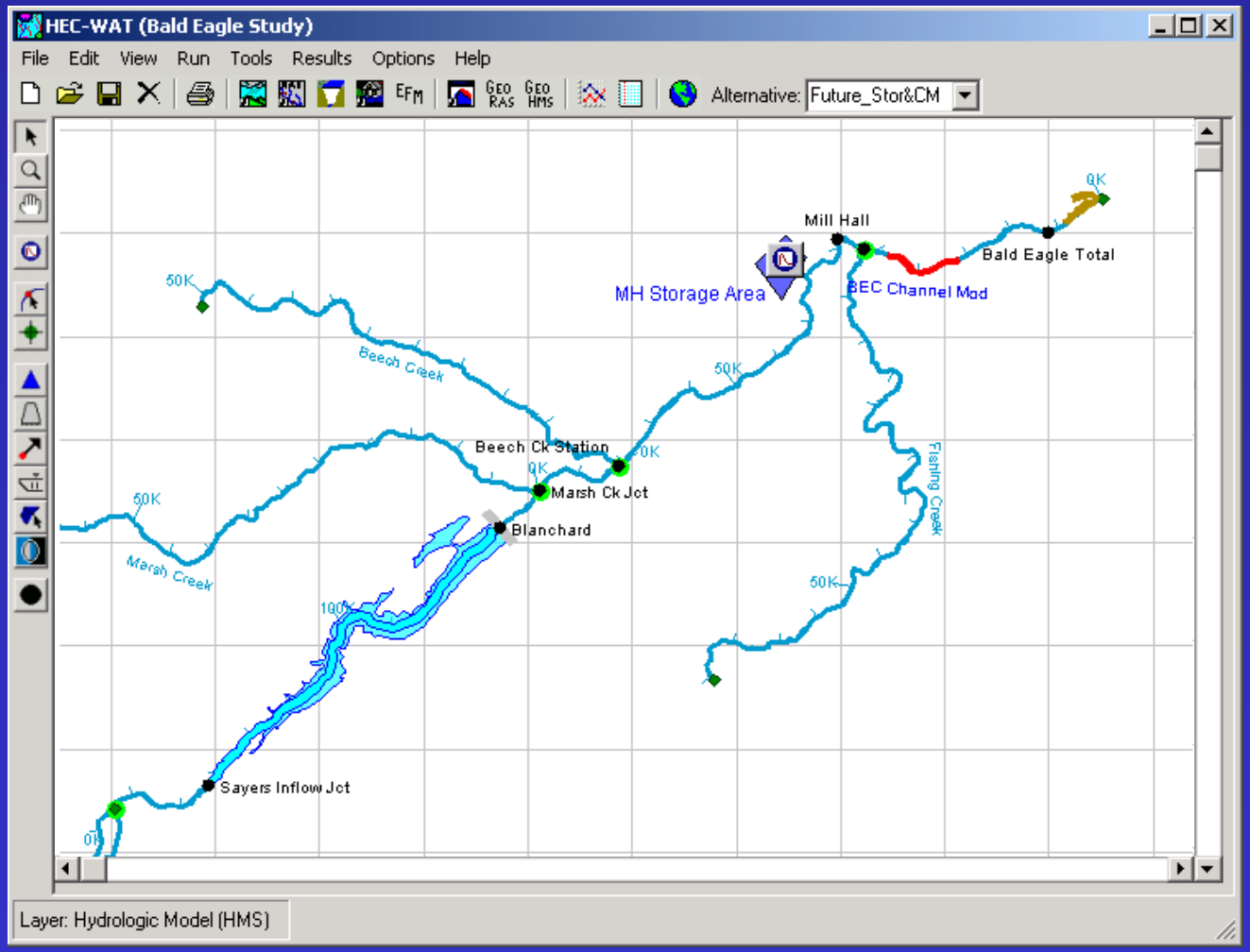


FDR Measure Selector
(With Storage and Channel Modification)



Future Alternative

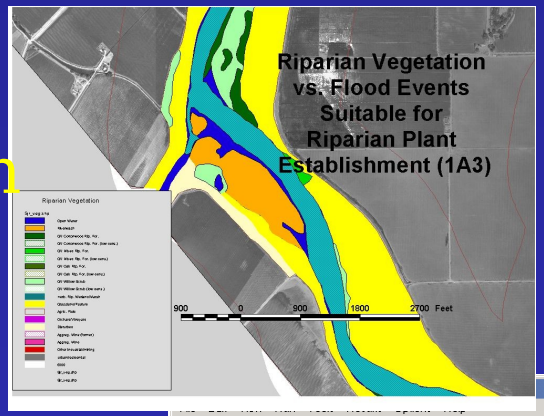
(With Storage and Channel Modification)

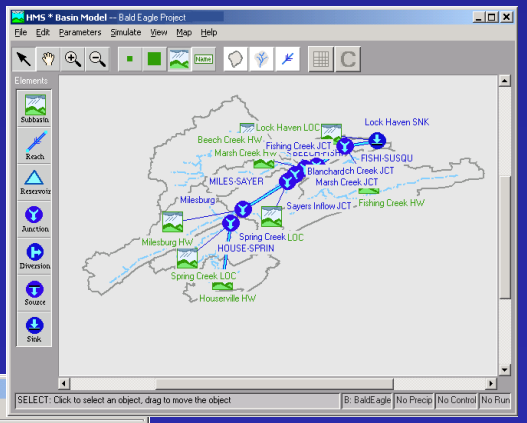


Data and Statistics

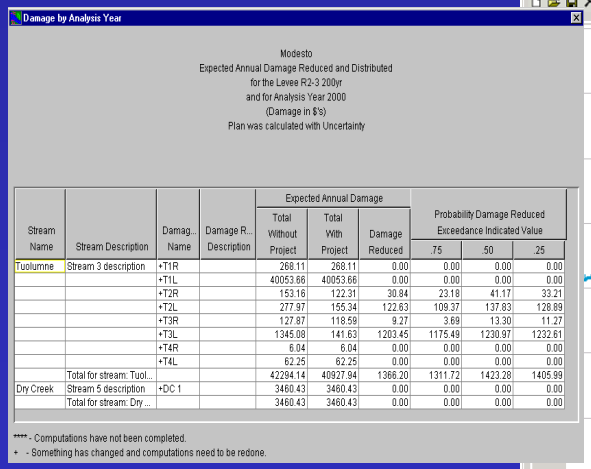
- Data Acquisition
  - Spatial Depiction
  - DSS
  - CWMS Database
- Data Visualization (DSSVue)
  - Anomalies
  - Breaks in record
  - Time Window
- Statistical Analysis
  - Frequency Analysis
  - Durational Analysis
  - Regression Analysis

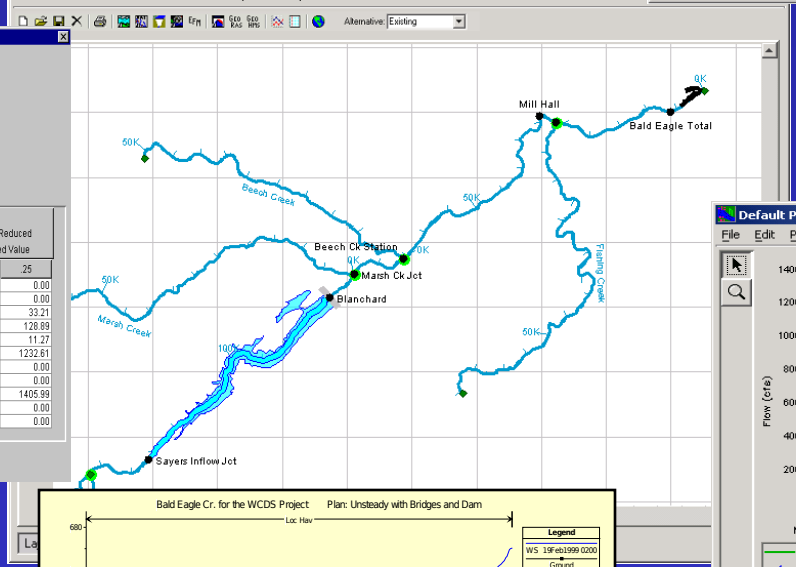
Environmental





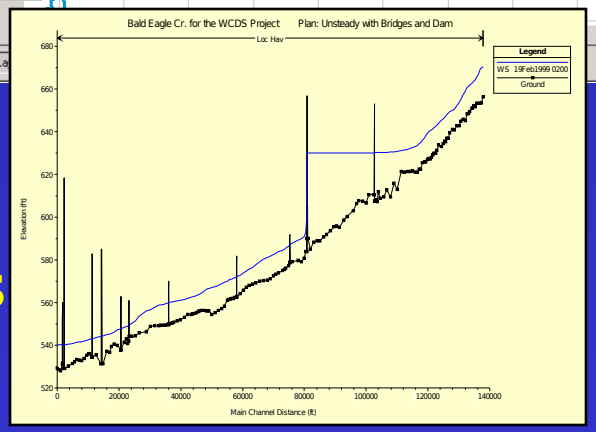
Hydrology

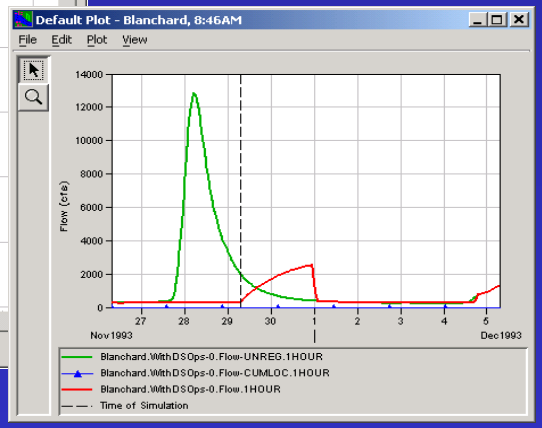

Damage by Analysis Year
Modesto
Expected Annual Damage Reduced and Distributed
for the Levee R2-3 200yr
and for Analysis Year 2000
(Damage in $'s)
Plan was calculated with Uncertainty
Stream Name
Stream Description
Damag... Name
Damage R... Description
Expected Annual Damage
Total Without Project
Total With Project
Damage Reduced
Probability Damage Reduced Exceedance Indicated Value
.75
.50
.25
Tuolumne
Stream 3 description
+T1R 268.11 268.11 0.00 0.00 0.00 0.00
+T1L 40053.66 40053.66 0.00 0.00 0.00 0.00
+T2R 153.16 122.31 30.84 23.18 41.17 33.21
+T2L 277.97 155.34 122.63 109.37 137.83 128.89
+T3R 127.87 118.59 9.27 3.69 13.30 11.27
+T3L 1345.08 141.63 1203.45 1175.49 1230.97 1232.61
+T4R 6.04 6.04 0.00 0.00 0.00 0.00
+T4L 62.25 62.25 0.00 0.00 0.00 0.00
Total for stream: Tuol... 42294.14 40927.94 1366.20 1311.72 1423.28 1405.99
Dry Creek
Stream 5 description
+DC 1 3460.43 3460.43 0.00 0.00 0.00 0.00
Total for stream: Dry... 3460.43 3460.43 0.00 0.00 0.00 0.00
**** - Computations have not been completed.
+ - Something has changed and computations need to be redone.



Flood Damage

Hydraulics





Reservoir

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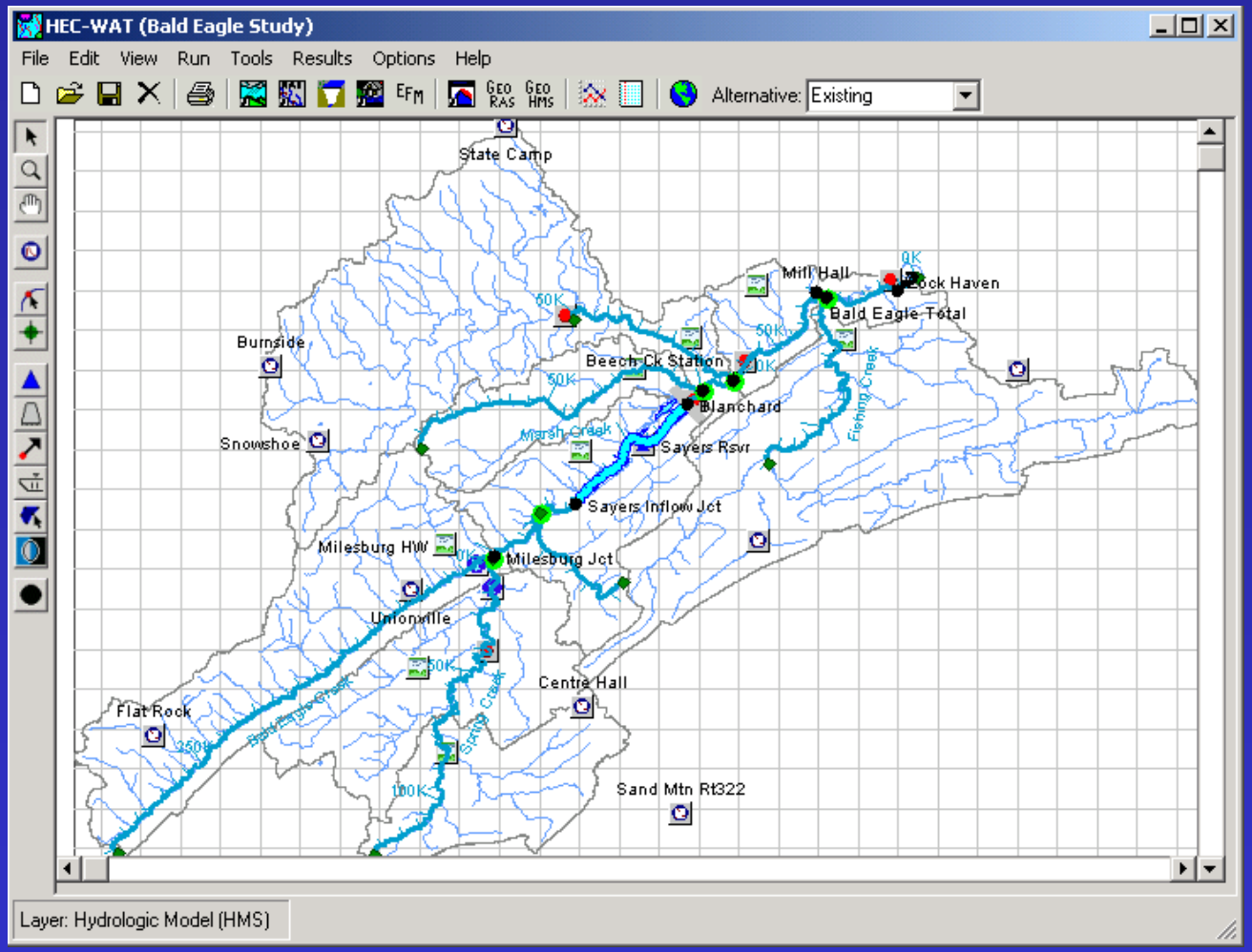
Watershed Analysis Output



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Simulation
(Output Reports and Graphs)

- Flow frequency curves
- Statistical plots
- Flow/stage hydrographs
- Inflow, storage, stage, outflow from reservoirs
- Cross-section plots
- Flood inundation boundary maps/water surface profiles
- Plan comparisons
- EAD with risk
- Cost (NED)
- Environmental displays (NER)

Environmental Applications

- HEC Enhancements
  - HEC-HMS (Sediment Wash off, WQ)
  - HEC-RAS (WQ, Temp, Sediment)
  - HEC-ResSim (WQ, Temp, DO, Variable gate settings)
  - HEC-FIA/FDA (Low flow features)
  - EFM
  - Other models

Near Term Development

- Complete detailed design
- Develop prototype
- Develop draft User's Manual

Future Development

- More GIS Displays
- Connections to other models (Corps/Non-Corps)
- NED/NER Tradeoff Analysis
- Groundwater capabilities
- Demonstration application